# Explaining Information Technology Use with the Usefulness Scale: A Comparison with User Age

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## ABSTRACT

*Understanding and predicting the use of information technology is an important problem in healthcare management. The relationships among user characteristics and information technology have generally been weak. This paper describes a recently developed scale that measures perceived usefulness of information technology. Following this description, the scale is compared with user age in ability to explain information technology use. The results suggest perceived usefulness explains a significant proportion of the variance in use ($r^2 = .13$, $p \leq 0.0001$), while age was not a significant predictor. Implications and suggestions for use of the usefulness scale are discussed.*

## INTRODUCTION

Many studies have examined use of medical and non-medical information technology. Generally, the purpose of these studies is to explain and/or predict voluntary use of information technology. A technology that is not used cannot be effective [1]. Explaining technology use can be excellent feedback for technology designers or can help diagnose problems with technology that are leading to poor acceptance. Predicting technology use could greatly assist information technology managers in selection among competing packages. Prediction of technology use might also benefit IS trainers by indicating the possible superiority of a particular training methodology.

Physicians have historically not used information technology in their daily routine [2-4]. While many reasons have been proposed, age of the user has received considerable attention [5,6]. However, age itself would seem to be a proxy for some underlying factor (e.g., reticence [5], lack of training). Theoretically, age is not the important factor, but a convenient measure for something that perhaps correlates with age. To attempt to measure this underlying theoretical factor, a perceived usefulness scale has been derived by Davis [7,8]. This usefulness scale is compared here with age in explaining use of information technology.

## METHODS

A summary of the development of the usefulness scale is presented here, and details can be found in [7]. Based largely on the theory of reasoned action, perceived usefulness is defined as "the degree to which a person believes that using a particular technology would enhance his or her job performance." A useful technology should have a positive use-performance relationship. Initially, 14 job performance items were candidates for the usefulness scale, though rigorous psychometric analysis [7-9] suggested that 6 items were sufficient to capture the semantic content of the usefulness construct. The final usefulness scale appears in Table 1.

**Table 1. Items of the Perceived Usefulness Scale**

| | |
|---|---|
| **1.** | Using [Technology X] allows me to accomplish tasks more quickly. |
| **2.** | Using [Technology X] enhances my effectiveness on the job. |
| **3.** | Using [Technology X] improves my job performance. |
| **4.** | Using [Technology X] makes it easier to do my job. |
| **5.** | Overall, I find using [Technology X] to be advantageous in my job. |
| **6.** | Using [Technology X] increases my productivity. |

These items seem to capture many of the variables speculated by others [5] to affect information technology use. For example, a large amount of time required to use the technology [10] is reflected in items 1 and 6. A lack of value in using the technology [11] seems similar items 3 and 5, as well as perhaps items 2 and 4.

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The usefulness scale is designed to be domain and technology independent. That is, the theory behind the scale suggests that a physician would not use medical information technology that he/she does not perceive as useful, nor would an auto mechanic use an automotive diagnostic technology that he/she does not perceive as useful. For this reason, we chose to measure perceived usefulness, age, and information technology use by individuals across a variety of industries, including healthcare. Approximately 80% of the respondents held professional to executive levels in their respective organizations. Nearly 80% were college educated. The average age of the respondents was 35.5 years; 41% of the respondents were female; and the average time with their current employer was 8.2 years. The technologies selected were voice mail (v-mail) and electronic mail (e-mail), and the particular systems used varied across and within organizations. Each respondent evaluated his or her specific v-mail and/or e-mail system (e.g., PC Eudora).

Confidential pencil-and-paper questionnaires were administered to 260 individuals across 10 organizations, and 118 questionnaires were returned, for a response rate of 45%. Given the theoretical technology independence of the usefulness scale (described above), we chose to report pooled results of the e-mail and v-mail systems, yielding 170 observations. (Of the 118 respondents, 52 used both e-mail and v-mail systems.) The usefulness items were each measured on 7-point Likert scales, ranging from "Strongly Disagree (1)" to "Strongly Agree (7)". The usefulness scale is the equally weighted sum of the six individual items. Age was self-reported in years. Use was self-reported as the sum of the number of messages sent and received on a typical day.

## RESULTS

As a preliminary check of the multi-item usefulness scale, reliability was verified. Cronbach's alpha was high, at .93, indicating that respondents' scores across the usefulness items tended to covary. The individual items appear to address the same construct as scores on the individual items move together across respondents.

Separate regression analyses were performed to investigate the explanatory powers of age, perceived usefulness, and the individual items of the perceived usefulness scale. Respectively, the results appear in Figures 1, 2, and 3a-3f.

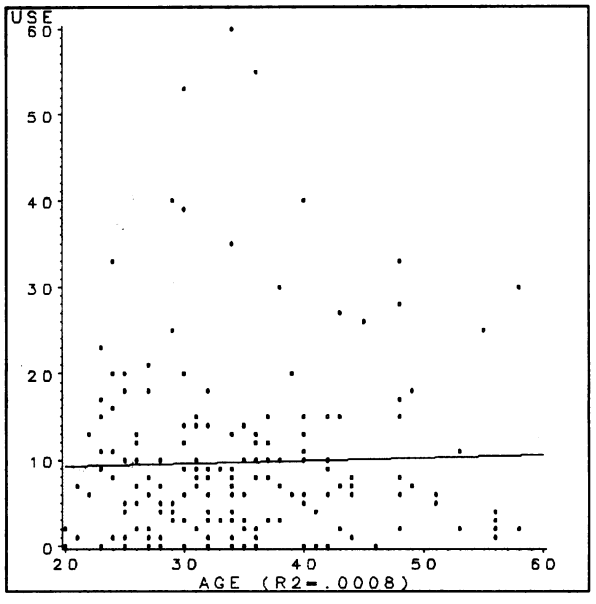


**Figure 1.** Use Regressed on Age

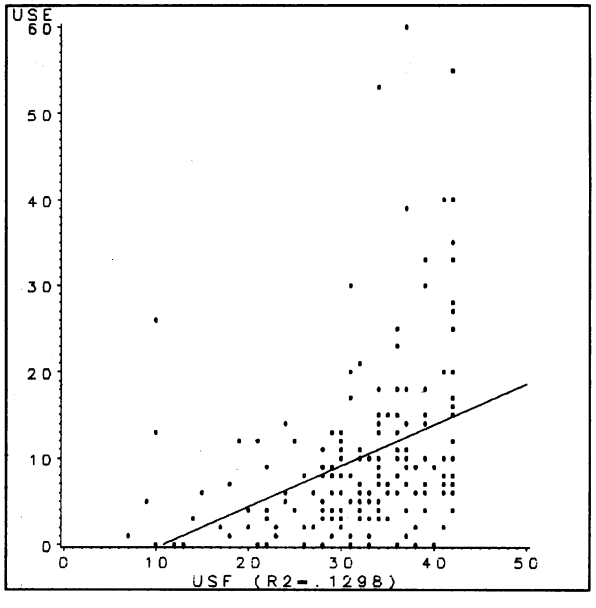


**Figure 2.** Use Regressed on Usefulness

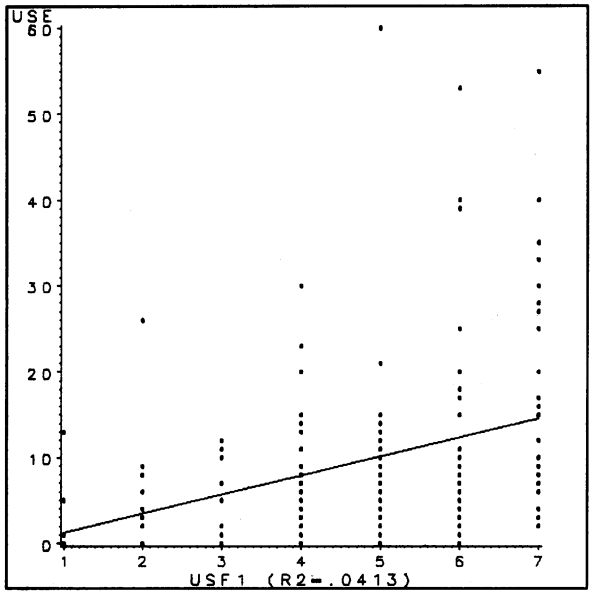


**Figure 3a.** Use Regressed on "Accomplish Tasks More Quickly"

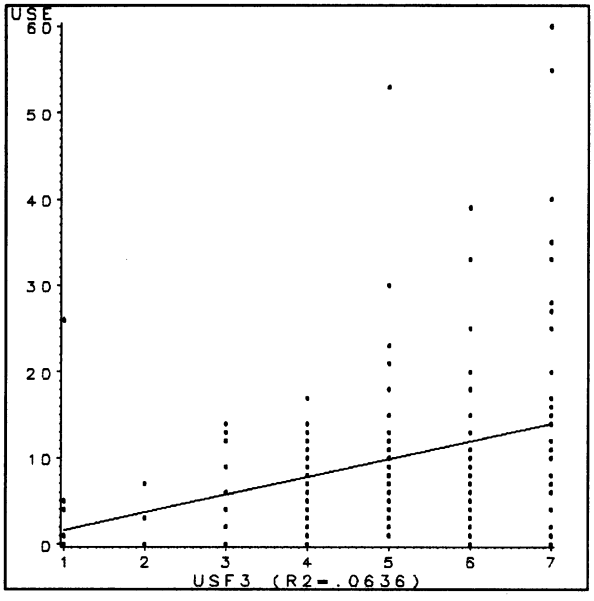


**Figure 3c.** Use Regressed on "Improving Job Performance

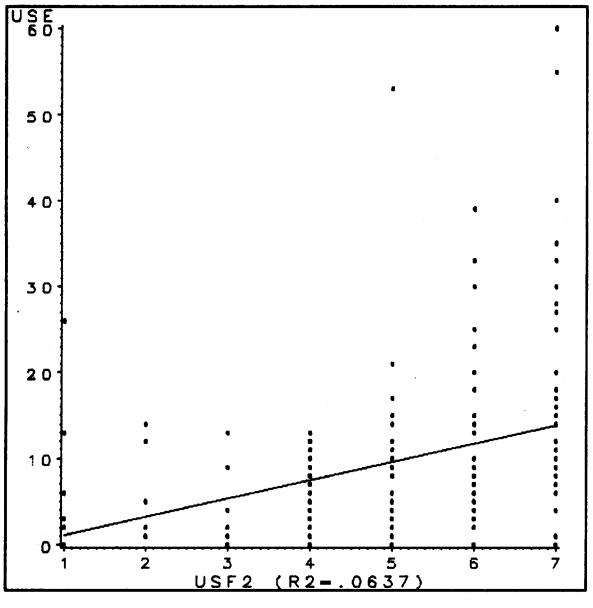


**Figure 3b.** Use Regressed on "Enhancing Effectiveness"

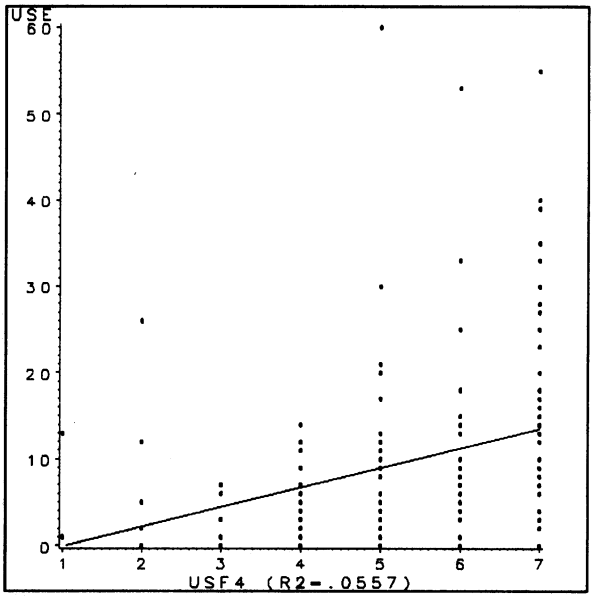


**Figure 3d.** Use Regressed on "Easier to do Job"

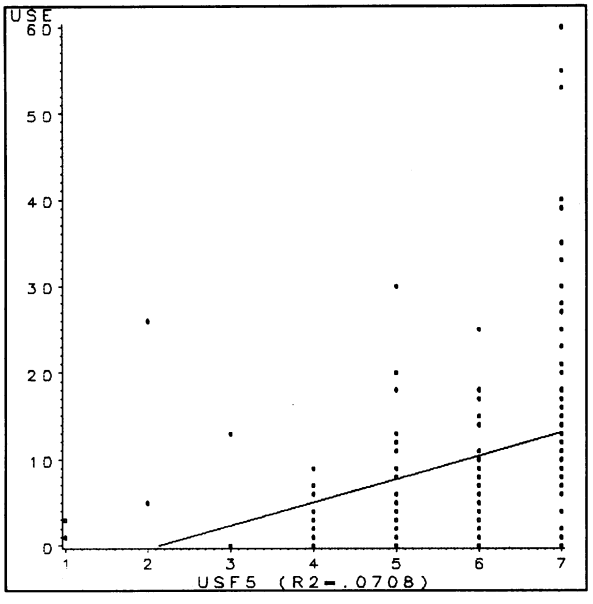


**Figure 3e.** Use Regressed on "Advantageous to my Job"

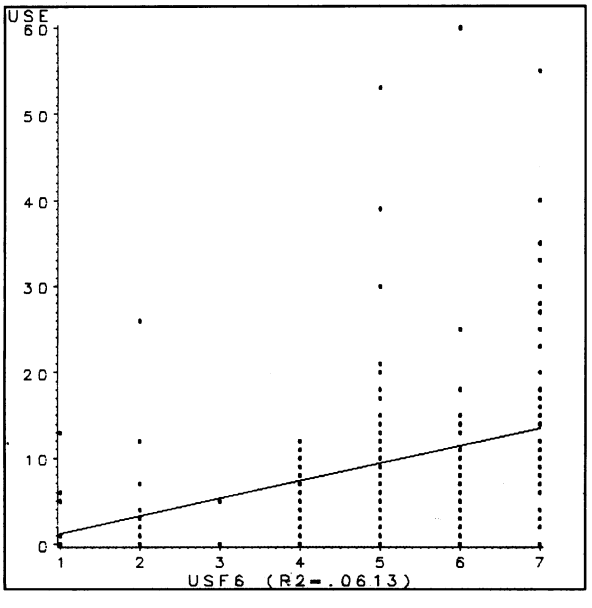


**Figure 3f.** Use Regressed on "Increases Productivity"

The model that regressed use on age (Figure 1) was a poor fit ($p>.05$). Only 0.08% of the variance in use was explained by age. In contrast, the model that regressed use on perceived usefulness (Figure 2) was significant ($p\leq.0001$), and 13% of the variance in use was explained by usefulness. The effect of age after controlling for usefulness was examined by adding age to the regression model containing usefulness. The effect of age again was not significant (figure not shown). Regression models of use on each of the perceived usefulness items were significant (all $p\leq.01$, Figures 3a-3f). Thus, each of the perceived usefulness items provided significantly more variance explanation than did age, and the overall perceived usefulness score seems to provide a substantially better fit than any of the individual items.

## DISCUSSION

There are several limitations to this study. First, measures of age and computer use were self reported. Intuitively, it would seem unlikely that large discrepancies would arise between actual and reported age on a confidential questionnaire, but the same argument may or may not be plausible for computer use. Some e-mail packages automatically log outgoing and incoming messages, in which case it would not be difficult to determine a good estimate for an average number of messages sent and received per day. This is probably not a feature of most v-mail systems, and there is no assurance that respondents checked the e-mail logs for verification of message estimates. Therefore, at least some error in the use measure is likely.

Another limitation of this study that use was measured concurrently with perceived usefulness. While we do not assess prediction of future use of an information technology, good results with the usefulness measure in this regard have been obtained elsewhere [7].

A third limitation of this study concerns the specific nature of a physician's job. While the perceived usefulness instrument is designed to be domain independent, improved performance of the measure in explaining information technology use might be possible through tailoring the instrument. That is, the specifics of usefulness to physicians might be better addressed in the items of the scale. Such tailoring was not performed here because we were interested in assessment across industries, including healthcare.

These limitations aside, the usefulness measure did show a strong relationship with information technology use. Each of the individual items was significant, though not as strongly as was the overall usefulness measure, as would be expected with a multi-item scale [12]. The relationship for age was weak, as found previously [5]. These findings have implications for different areas of healthcare management.

The usefulness measure may be the best available predictor of subsequent computer use. This would be

important information for information technology managers who must predict user load in advance of software procurement when optimal pricing might be available through volume discounts. This measure may also be useful to software trainers who desire immediate feedback on the quality of training. This measure could easily be administered following a training session, and the results would indicate training effectiveness, as users should understand the usefulness of a technology if they have been effectively trained to use the technology and understand the role of the technology within the organization. For example, trainees could be randomized into one of two training programs, and perceived usefulness could be measured following training.

The usefulness measure was shown to capture the effects of several other variables that have been speculated to be influential in explaining information technology use. Many other variables exist, and some would fall under the category of "ease of use" (e.g., prior experience [13], skills [14]). While it might be tempting to investigate the additional contribution of ease of use, previous research has suggested that ease of use explains little beyond that explained by usefulness [7, 9]. One reason offered for this is that individuals may feel that a technology is more useful once they find it easy to use. For example, as someone gets better at MEDLINE searching (ease of use increases), use of MEDLINE would help the individual work more quickly (a usefulness item). Thus, ease of use affects usefulness, which in turn affects use. Still, more research is needed to compare usefulness with other measures (e.g., Hudiburg's Computer Technology Hassles Scale [15]).

In conclusion, the usefulness scale predicts use well and may play an important role in the management of information technology. While a large degree of use of information technology remains unexplained, usefulness explains a significant portion. Refinement of the usefulness scale and a better understanding of its fundamental properties are needed Nonetheless, we believe this paper demonstrates the potential value of the perceived usefulness scale.

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